Proliferation of EMC STDs

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EMC CHALLENGES STANDARDS PROLIFERATION

- **Commercial, Military, Aerospace, Automobile, Telecom, and Nuclear**
- **Main Standards**
  - **European and US Commercial**
  - **MIL-STD-461**
  - **RTCA DO-160**
  - **SAE J1111 Series**
  - **GR-1089-CORE**
  - **EPRI-102323**

EMC CHALLENGES STANDARDS PROLIFERATION

- **Commercial Breaks into Consumers, Medical, and Industrial (US, Taiwan, Japan, and Europe)**
  - **Emissions per EN55011 or EN55022**
    - **10/30 m OATS RE and voltage on LISN CE**
    - **FCC at 3 or 10 m**

EMC CHALLENGES STANDARDS PROLIFERATION

- **Commercial Breaks into Consumers, Medical, Industrial (Europe)**
  - **Immunity falls under EN61000-4 Series**
    - **ESD (2 - 8 kV contact; 2 - 15 kV air)**
    - **Radiated Immunity (3 - 10 V/m field cal)**
    - **Electrical Fast Transient (5 x 50 ns 0.5 - 4 kV 2.5 kHz PRR)**
      - **Capacitively coupled**
    - **Surge (1.2 x 50 us/8 x 20 us Combo 4 kV) Direct coupled**
    - **Conducted Immunity (3 - 10 V rms)**
    - **Magnetic Field (1 -100 A/m)**
    - **Power line dips and interruption (up to 100%)**

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- **Military Breaks into Services or Platform (DEF-STD, STANAG, Euro-Fighter, NASA, etc.)**
- **All Similar to MIL-STD-461**
- **Emissions - RE H and E-Field 30 Hz - 40 GHz (at 1m)**
  - **CE - Power 30 Hz - 10 MHz V and I measurement**
  - **Single setup for all test**

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- **Susceptibility**
- **RS H and E-Field 30 Hz - 40 GHz (closed loop)**
  - **CS - Signal 30 Hz - 150 kHz voltage**
    - **Power & Signal - 10 kHz - 200 MHz - BCI**
    - **Power & Signal - Transients 2 x 30 ns 500V/ 5A**
    - **Power & Signal - Transient 10 kHz - 100 MHz DS 1kV/10 A**
    - **Special requirements for receivers, transmitters, etc.**
  - **Single setup for all test**

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- **Commercial Aircraft are Platform Specific, but generally follows RTCA DO-160 (FAA/JAA)**
- **Similar to MIL-STD-461**
- **Emissions and Susceptibility follow MIL**
- **Higher level transient test (lightning)**
- **Cable coupling test differ**
- **Magnetic compass test**
- **Single setup for all tests**

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- **Automobile Breaks into Manufacturer (real mess)**
- **SAE J1113 Series**
- **Ford - ES-F7UB - XXXX**
- **GM - 9100 Series**
- **Chrysler LP-388-C-XX**
- **International Manufacturer**

EMC CHALLENGES STANDARDS PROLIFERATION

- **Nuclear (US) requires EPRI-102323**
- **Incorporates MIL, ANSI and EU**
- **RE per MIL (10 kHz - 10 GHz)**
- **RI per MIL 10 V/m (10 kHz - 10 GHz)**
- **CE per MIL 30 Hz - 50 MHz**
- **CI per MIL 10 kHz - 400 MHz BCI**
- **CE allowed for certain test**
- **ESD, EFT, and Surge**

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GR-1089-CORE con’t

- **ESD**
- **Lightning requirement for telecom ports**
- **Power cross requirements**
- **Magnetic Induction**
- **Safety and Grounding**

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- **ETSI - EN300-386 (R&TTE)**
- **Incorporates EN61000-4 and EN55022**
- **Similar as Industrial EU**
- **Special setups for CI**
- **Special matching networks required**
- **ESD**
- **Magnetic Induction**
- **Lightning and Surge (power-cross)**

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- **See Appendices for other Standards**
- **Can break into other categories**
- **No one lab can meet all requirements**
- **EN61000-4 has additional documents for immunity**
  - **up to 4-28**

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- **Future ????**
  - **US & European close on commercial (assuming no more EN61000-4 requirements)**
  - **MIL in good shape**
  - **FAA and JAA appear to be in good shape**
  - **Telecom in Europe in good shape**
  - **Telecom STD in US on hold- RBOCs have specific docs**
  - **Automobile ? -A2LA? SAE**
  - **Rest of the world**

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Future ???? Con’t

- **Japan one route is VCCI - accepts ANSI C63.4 but must declare spec is flawed**
- **Taiwan - only accepts 10 m RE data, A2LA with additional requirements on reports**
- **Mexico - will not accept outside labs**
- **Discussion**